IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT DIVISION

RESPONSE/AMENDMENT

Applicant: Bruce A. Jennings	) April 11, 2004
Appl. No.: 09/848,789	) Attorney Docket No. RAR358.01
Filing Date: 05/04/2001	) Group Art Unit 2834
Title: Annular Electro-Mechanical Battery	) Examiner: Tamai, Karl I.

HONORABLE COMMISSIONER OF PATENTS AND TRADEMARKS
Alexandria, VA 22313-1450

RULE 132 DECLARATION

I, Bruce A. Jennings, do hereby declare that:

1. I am the inventor for the above-identified patent application and I reside at 14163 French Prairie Road, Woodburn, Oregon 97071.

2. I have 22 years experience in industrial engineering and fabrication, and have been instrumental in the design, construction, and installation of over $10 million worth of industrial equipment in the roles of employee, subcontractor and manufacturer. I am the sole owner of Velocitech, an engineering and fabrication firm which I founded in 1997. Velocitech is presently producing and developing a variety of industrial machinery and recreational products. Two high-performance three-wheeled street vehicles have been designed and constructed, and a composite ski bike is being researched.

3. I have closely followed the development of composite flywheel energy storage for more than a decade. My designs, parts of which are disclosed in the present patent application, have gained the interest of flywheel development programs in several federal agencies. In the past several years, I have been invited to, and attended, meetings with the heads of flywheel research for the United States

Air Force, NASA, and the United States Department of Energy. I have also recently met personally with the head of Energy Storage for the United States Department of Energy, and was asked to submit for his examination a detailed report discussing the structure and levitation elements currently under development

4. During the development of my composite flywheel energy storage devices, I have met with many engineers and other technical professionals, attended technical meetings and conferences and reviewed numerous industry and technology publications. As a result of my experience, I believe I have acquired quite an appreciation of the technology associated with composite flywheel energy storage devices, including electro-mechanical batteries.

5. I have reviewed the Examiner's Office Action dated October 10, 2003 with regard to the present patent application (Patent Application No. 09/848,789) and the patents cited therein, particularly the Triplett patent (U.S. Patent No. 4,870,310), U.S. Patent No. 6,111,332 to Post and the Japanese patents to Hagiwara (JP 56-063,117) and Murakami, et al. (JP 59-373,323), in sufficient detail to understand these references. It is my understanding that the Examiner has rejected claims 1, 2, 9-11, 12, 16-18 and 24-26 of the present patent application based on obviousness under 35 U.S.C. § 103(a). With regard to claim 12, pertaining to the substantially teardrop-shaped cross-section for the composite rotor, the Examiner stated that "Triplett teaches a teardrop composite rotor 29 supported by magnetic bearings ...." (Office Action, page 3, paragraph 6)

6. I maintain that the teardrop cross-section, combined with the surface reinforcement filaments of the rotor design, disclosed in my patent application not only provides advantages over prior art, but also is unique and neither revealed in, nor anticipated or made obvious by, existing patents, including the Triplett patent and the other patent references cited by the Examiner.

7. My rotor design utilizes a novel and advantageous structural reinforcement composed of high-strength filaments spiral-wound over the surface of the hoop-wound filament composite rotor. The strength and rigidity afforded by this surface reinforcement is intrinsically dependent on the underlying teardrop shape, for several reasons. First, as seen in natural systems, the teardrop shape

represents the dynamic state of equilibrium when a fluid is subjected to a continuous, unidirectional force. In this case, the "fluid" consists of the highly viscous composite rotor subjected to extreme centrifugal forces. The surface reinforcement filaments represent the surface tension, enclosing the "fluid's" volume in a dynamically balanced shape. Second, the convex external curvature of the teardrop shape provides a state of positive tension throughout the surface reinforcement filaments. This tension is required to resist the centrifugal forces exerted on the mass of the rotor during operation. Third, as the surface reinforcement filaments follow a spiral wound pattern over the surface of the rotor, the teardrop curvature eliminates dramatic transitions which would be present in other cross-sectional shapes (i.e. rectangles, trapezoids, etc.). Such transitions, if present, would create stress points along the surface filaments, in turn leading to possible structural failure of these filaments while under load.

8. In contrast to the present invention, the Triplett patent, cited by the examiner as teaching the use of a teardrop composite rotor, clearly presents an isosceles trapezoid for a rotor cross-section. No where does the patent text or drawings of the Triplett patent allude to the possible or foreseeable use of a teardrop shape, nor would there be any obvious advantage for that rotor design to utilize a teardrop shape in order to achieve the novel features disclosed in the Triplett patent. In fact, little if any benefit would be afforded Triplett's rotor design, as well as other rotor designs (including mine), simply by fabricating the rotor from hoop-wound filaments into a teardrop cross-sectional shape. As set forth below, the teardrop cross-section of my invention is necessary to the optimal function of the spiral-wound filaments. Triplett has no external surface winding.

9. While Triplett shares a common advantage with my rotor design by placing a greater percentage of rotor mass along the outer circumference of his rotor for an increase in rotor-mass efficiency, no additional advantage would be gained simply by rendering the rotor cross-section as a continuously convex curved surface to form a teardrop cross-section. In fact, the increased difficulties involved in the fabrication of an exclusively hoop-wound composite rotor of teardrop cross-section could not be justified without some clear advantage being recognized in the feature, of which none is claimed, or alluded to, by Triplett or others.

10. In contrast, the structural advantages of my rotor design over prior art are derived largely by the spiral-wound surface filaments described in the patent. Composite fibers afford their greatest strength, by far, when placed inplane to applied tension forces. Tension forces applied cross-plane to the fibers, to a large degree, must rely on the strength of the composite material's binder in order to resist structural failure. Industry research has shown that hoop-wound composite rotors are vulnerable to radial delamination (binder failure) while under the extreme centrifugal loads generated during operation, when composite material that is farther from the center of rotation is subjected to greater stress levels than subsequent material.

11. In order to achieve higher levels of performance from a given rotor mass, my design efficiently utilizes the inplane strength of fibers by applying support fibers in spiral fashion to the surface of a hoop-wound composite core, minimizing the tendency of the hoop-wound fibers to delaminate. These surface fibers are wound in spiral fashion about the hoop-wound core to form an equilateral triangular pattern, in plan view. This equilateral triangular pattern affords, what I believe to be, the highest level of strength and rigidity from such a surface structure. This pattern subsequently establishes the 2:1 inside to outside ratio of the annular rotor, derived from the points at which the midpoints and ends of the equilateral triangle sides contact the inside and outside diameters (respectively) of the annular composite rotor. Further, the teardrop cross-section is based upon, and necessary to, these spiral-wound filaments in order to create the appropriate pre-tension required for their proper function, and to eliminate the stress points which would be imposed on these spiral-wound filaments by use of any non-teardrop (i.e. rectangular, trapezoidal, etc.) cross-sectional rotor shape.

12. Based on my experience in the industry and familiarity with the engineering process applied to that industry, I do not believe that those skilled in the art of this technology would have considered it obvious to utilize a teardrop cross-section in the device described in the Triplett patent or to combine the teachings of the Triplett patent with the Post and/or Hagiwara patents to obtain the teardrop configuration of the present invention. Nothing in any of the patents referenced by the Examiner suggests, compels or motivates a person to make such a combination. Unless a person

already had determined that it would be beneficial and useful to utilize a teardrop cross-section for a composite rotor, there is no reason that a person would have combined any of the above patents to obtain the electro-mechanical battery set forth in my patent application.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patents issuing thereon.

I declare under penalty of perjury under the laws of the State of California that this declaration was executed on April 11, 2004, in Fresno, California.

Bruce A. Jennings

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